BA SANGAM COLLEGE

YEAR 11

APPLIED TECHNOLOGY

WORKSHEET 4

Subject: Applied Technology		**Year/Level:** 11
Week: 4	**Lesson** 1	**Date:**
Topic: Machines and Engine (Portable Circular Saw)		

LESSON PREPARATION:

- Prepared lesson notes
- prepared follow up work

PREVIOUS LEARNING/PRIOR ASSOCIATED LEARNING:

Students have not covered this topic but some students have engaged with some portable machines and they are engaged with some work with the use of some portable machines such portable circular saw, jig saw, portable planer and etc.

LEARNING OBJECTIVES:

At the end of the lesson, students should be able to:

Cognitive Domain:

1) Name the different parts of the portable circular saw.
2) Define portable power tools and machine tools.
3) Know the safe operation and use of the portable power saw.w

Psychomotor Domain:

1) Apply the power tools in real life situation.
2) Rip and grooved the work piece.

Affective Domain:

1) Appreciate the application of the power tools when using it.

TEACHING RESOURCES (MATERIAL AND VISUAL AIDS)

- Lesson notes

FOLLOW UP WORK:

- Students Activity

LESSON NOTES:

DEFINITIONS

Portable Power Tools:

Are basically hand tools which may be driven by an AC or DC electric current or by compressed air. As they are not fixed to a floor or a bench, and are relatively compact, they can be easily transported to the worksite.

Machine Tools:

Are tools usually fixed in place, or are too large to transport easily, which requires the user to take the job to the machine.

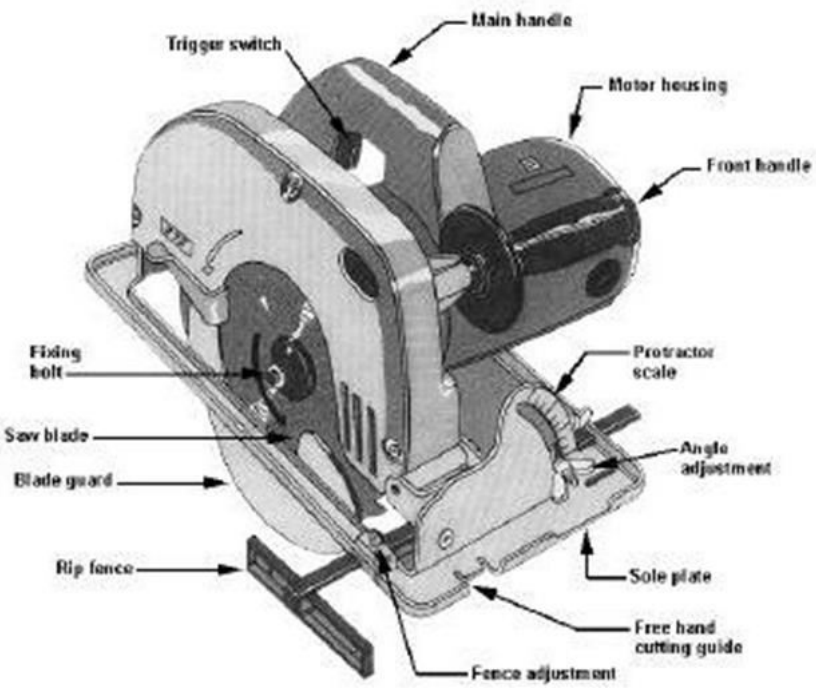
Power tools are grouped into three main categories:

1. Cutting
2. Fixing
3. Finishing

PORTABLE CIRCULAR POWER SAW

There are many types of powered saws used within the building industry such as the jig saw, chain saw, brick cutting saw, mitre saw, and sabre saw, with the portable circular saw being the most common. Circular saws are available in a variety of sizes (184 mm to 260 mm), with the name of the saw being governed by its blade size, and may be used for many cutting operations such as:

Ripping / Crosscutting /Compound cutting / Grooving / Rebating / Trenching



SAFE OPERATION AND USE OF THE PORTABLE POWER SAW

To use the portable power saw CORRECTLY and SAFELY you MUST:

- Check all adjustments are tightened before use; the saw must be fitted with a hood guard and a spring guard. The spring guard below the guide plate must operate freely and return to cover the blade when not in use;
- Never tie the guard back; operate the saw with both hands; do not force the saw. If it stalls or loses speed, free the blade by pulling the saw back. Wait for the saw to regain full speed before continuing the cut;
- After the cutting operation is complete, check to ensure the guard springs back to the closed position before placing on any surface;
- Always switch off before removing the saw from the timber;
- Rest the saw on blocks when not in use, to prevent damage to the guard;
- Keep fingers and hands clear of the blade;
- Use the correct type of blade for the work being performed;
- Never use the saw above your head;
- Do not stretch to make a cut;
- Switch off the power and remove the plug before making any adjustments to the saw;
- Unless governed to a depth of cut, the blade should be set to full depth at all times to prevent kickback and provide optimum performance;
- Keep the work area clean and free from off-cuts;
- Always wear safety glasses and hearing protection;
- All extension leads must be well behind the saw and run up and over the operators shoulder to ensure it does not drop under the work being cut.

STUDENTS ACTIVITY:

1. Differentiate portable power tools and machine tools:

_____
_____
_____

2. State two purpose of the saw guard.

a. _____

b. _____

3. List down 5 safeties that one need to be aware of when operating or using the portable power saw.

_____
_____
_____

_____
_____

Reference:

Year 11 Applied Technology Textbook, MEHA.

INDUSTRIAL ARTS DEPARTMENT LESSON PLAN

Subject: Applied Technology		**Year/Level:** 11
Week: 4	**Lesson** 2	**Date:**
Topic: Machine and Engine (Using the portable circular saw)		

LESSON PREPARATION:

- Prepared lesson notes
- prepared follow up work

PREVIOUS LEARNING/PRIOR ASSOCIATED LEARNING:

Students have learn in the previous lesson on the difference between portable power tools and machine tools as well for the parts of the portable circular saw and the safe operation and uses of portable power saw.

LEARNING OBJECTIVES:

At the end of the lesson, students should be able to:

Cognitive Domain:

1) Know and understand how to rip, rebate and grooved when given a piece of timber.

Psychomotor Domain:

1) Apply the ripping, rebating and grooving of a given work piece.

Affective Domain:

1) Demonstrate hands-on skills on a given work piece and appreciate application of ripping, grooving and rebating.

TEACHING RESOURCES (MATERIAL AND VISUAL AIDS)

- Lesson notes

FOLLOW UP WORK:

- Students Activity

LESSON NOTES:

Using the portable circular saw

Ripping:

The material being cut should be well secured, i.e. it should be cramped or nailed to a bench, solid surface or to saw stools. This will allow both hands to control the saw so an even pressure may be applied.

As the saw passes along the length of the timber being ripped the section already cut tends to close in on the blade, which can lead to jamming, laboring of the motor or even kickback.

To prevent this occurring most saws are fitted with a "riving knife" but when this is not fitted the operator may insert a wedge or a chisel in the cut behind the saw to prevent the saw kerf closing. A fence guide may be fitted to the saw for parallel cutting.

When ripping sheet material beyond the capacity of the standard fence guide it is necessary to support the sheet on either side underneath the cut. This will allow the blade to pass through without cutting the stools or bench below and also prevents the sheet dropping against the blade.

Crosscutting:

The material may be cramped, nailed or held with a knee onto the saw stool while the saw cuts across the width of the timber or sheet material. A guide may be cramped or nailed to the face of the material to be cut allowing the sole plate to be pushed up against it, which will ensure a straight cut. This is particularly useful when cutting wide or sheet material.

Rebating and Grooving:

When rebating timber, the saw is fitted with a standard fence guide and set to the required width from an edge, set to depth and run the full length of the timber.

Rebating

Grooving

It is then set to the required distance from the face, set to depth and run the full length of the timber which allows a full length square or rectangular piece to be removed.

This may also be achieved by use of a patent type guide plate or a timber fence nailed to the job a distance equal to the width of the sole plate plus the amount of rebate required, less the thickness of the blade. This is generally used for wide boards. The same procedures may be used when grooving timber on the face and/or edge, however when grooving the bottom edge of a sliding door, the door must be held securely over a bench or saw stool in an upright angle to allow safe cutting.

STUDENTS ACTIVITY:

1. When ripping a piece of timber using the circular saw, "riving knife" is fitted in the cut behind the kerf (a cut made by the saw). Why is this done?

_____
_____

2. State a reason why a fence guide is fitted to the saw.

_____

3. Name the four methods of cutting when using a portable circular saw.

a. _____

b. _____

c. _____

d. _____

Reference:

Year 11 Applied Technology Textbook, MEHA

INDUSTRIAL ARTS DEPARTMENT LESSON PLAN

Subject: Applied Technology		**Year/Level:** 11
Week: 4	**Lesson** 3	**Date:**
Topic: Machines and Engine (Jig Saw)		

LESSON PREPARATION:

- Prepared lesson notes
- prepared follow up work

PREVIOUS LEARNING/PRIOR ASSOCIATED LEARNING:

Based on the previous lesson, students have learned the different parts of the circular saw, the different methods of using the circular saw. Some students jig saw at home where they have already had a clear view of the machine and how it is operated.

LEARNING OBJECTIVES:

At the end of the lesson, students should be able to:

Cognitive Domain:

1) List down all the safety precaution when operating and using the jig saw.

Psychomotor Domain:

1) Use the jig saw on a given work piece.
2) Apply all the safety precaution when operating the jig saw.

Affective Domain:

1) Appreciate the application of the jig saw when given a work piece.

TEACHING RESOURCES (MATERIAL AND VISUAL AIDS)

- Lesson notes

FOLLOW UP WORK:

- Students Activity

LESSON NOTES:

Jig saw:

This is a tool used mainly for making internal cut not possible or practicable with the band saw or circular saw. It can use for straight cut, cross cut and angle cut. A saber blade is a blade held at one end only , is fixed onto the jaw of a chuck up and down as much as 4000 strokes may be 12mm to 25mm depending on the type of tool.

As the blade is fitted with the stroke and so tends to pull the tool against the material being cut. The down stroke tends to push the tool upwards causing some vibrations, so it must held firmly.

Safe operation and use of jig saw:

- As for all portable power tools do not force the jig saw and over-load the motor, use the correct type of blade and make sure it is shape.
- Carry out the usual electrical and mechanical safety checks before use.
- . Make sure the work is held securely to prevent vibration or flutter and press the jig saw firmly on the jig saw firmly on the surface keeping the sole plate flat.
- Don‘t wear –loose clothing –keep fingers well away from blade.

Uses:

Jig saw can be used for straight, curved or irregular sawing either internally or externally. For internal sawing a hole is usually bored in the material form which the cutting starts. Some jig saw can be started, for internal cuts, by tilting the saw on the saw on front of its forked sole plate, and then while the tool is operating it is gradually lowered to its normal position –the pointed sabre blade pulls itself into the wood.

N.B. The jig saw cuts on the upward stroke of the blade.

Besides cutting wood up to about 50mm thick, the saw can be used with special blades for sawing metals up to 10mm thick (depends on the hardness and type of metal), for cutting plastics, rubber, paper, cardboard and leather. Use a lubricant when cutting metals. Some models can be reversed and held in the vice or fitted to specially designed stand or table and used as a fixed bench jig saw.

Bevel cuts can be made with saws provided with tilting sole plates, and those which can be fitted be fitted with a special base can be used for corrugated materials such as corrugated roofing iron and asbestos sheets.

STUDENTS ACTIVITY:

1. State down the main purpose of the jig saw.
_____

2. What precaution should be taken when cutting curves with the jig saw?
_____
_____

3. Briefly explain two safety precautions that should be taken when operating a jig saw?

_____
_____
_____
_____

Reference:

Year 11 Applied Technology Textbook, MEHA.

Subject: Applied Technology		**Year/Level:** 11
Week: 4	**Lesson** 4	**Date:**
Topic: Machines and Engine (Portable Electric Router)		

LESSON PREPARATION:

- Prepared lesson notes
- prepared follow up work

PREVIOUS LEARNING/PRIOR ASSOCIATED LEARNING:

Students have not learn this machine as some of the students come across this types of portable machine which is electric router for the first time. They have learn two portable machines in the previous lesson and they have a clear picture on this type of portable machines and some students have electric router in their homes and that will have an impact on teaching and learning where they will share their views and ideas on this type of machine.

LEARNING OBJECTIVES:

At the end of the lesson, students should be able to:

Cognitive Domain:

1 Know and understand the different parts of the electric router and the types of bits that can be fitted into it.
2 Differentiate the two types of electric router which is standard routers and plunge routers

Psychomotor Domain:

1 Use the portable electric router when told to do so.
2 Apply all the safety keys when operating the machine.

Affective Domain:

1) Appreciate the application of the machine in wood work.

TEACHING RESOURCES (MATERIAL AND VISUAL AIDS)

- Lesson notes

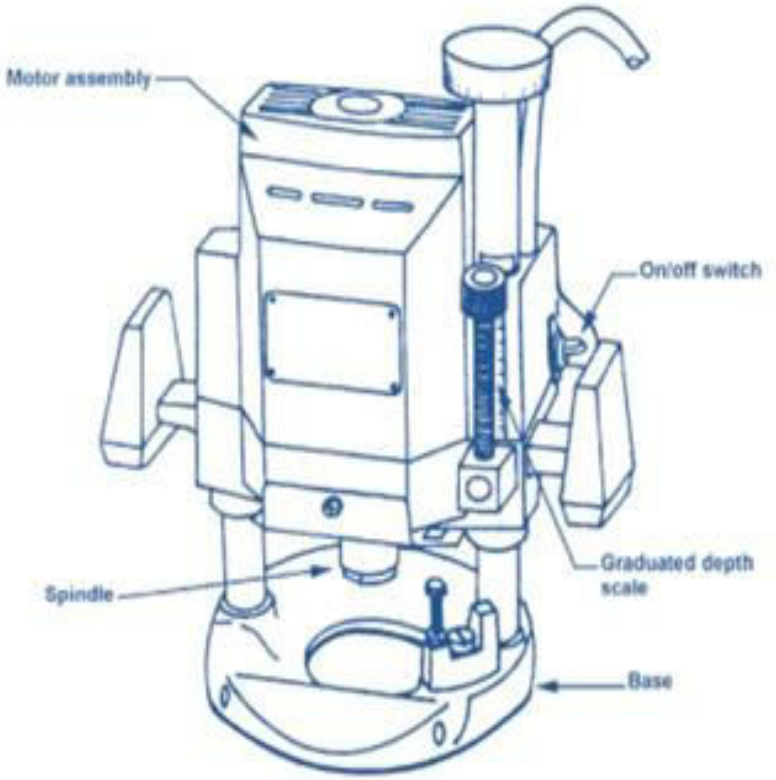
FOLLOW UP WORK:

- Students Activity

LESSON NOTES:

Portable Electric Router:

The portable electric router is a high speed spindle moulder and shaper, which may be used in the workshop or on-site. The versatility of the router lies in the variety of bits and cutters that are designed for its use and unlike the joinery shop fixed bench type spindle moulder, it is portable. It has a high speed revolving cutter (2000 - 27,000 r.p.m) that gives a very neat, clean cut.



There are a wide range of routers available, which have differing power and speed ratings to suit a variety of work. They are usually purchased with accessories such as an adjustable fence, template guide etc.

Routers fall into two (2) main categories:

1. Standard Routers
2. Plunge Routers

Standard Router

The standard type has an adjustable base which screws in or out to gain the required cutter depth. With this type of router the cutter protrudes past the base plate at all times, therefore care must be taken to avoid contact with other materials, including the operator‘s fingers.

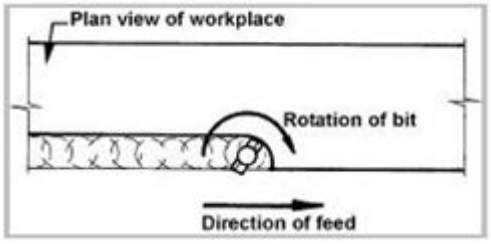
Plunge Router

This type is a fairly recent development with the advantage of having the base plate spring loaded. When the machine is not in use the base is fully extended and covers the cutter, protecting the operator and the cutter from accidental damage. Most of these machines have a number of adjustable stops, which can be present to the depth of the cut required.

Safe Operation and Use of the Electric Portable Router:

To use the electric router CORRECTLY and SAFELY you MUST:

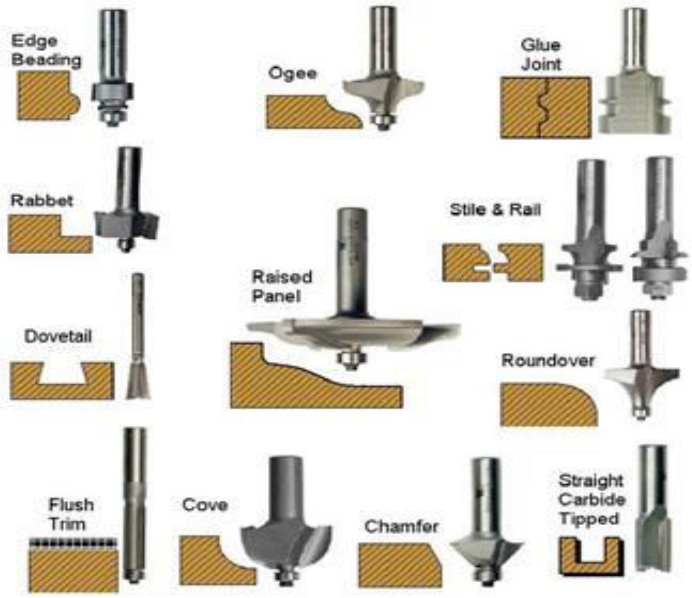
- Always wear safety glasses and hearing protection;
- Make sure the collet and bit shanks are clean;
- Always ensure the cutters are sharp;
- After installing the cutting bit ensure the collet nut is tightened firmly;
- Oil external faces of the spring pillars on the plunge router frequently to ensure Smooth operation;
- Before connection to power outlet ensure that all adjustments are tight, the cutting
- Bit moves freely and the switch is OFF;
- The depth of the cut may vary, depending on the hardness of the timber being cut.
- It is more practical to take three light cuts rather than one heavy cut;
- Operate the router in the correct direction of feed in relation to the bit rotation, as shown below. Note that the direction of rotation is *clockwise* when viewed on plan:



- Hold the machine firmly with both hands while operating;
- Ensure that the motor has completely stopped before removing the router from the work;
- Always lay the router on its side with the exposed cutter away from the operator when not in use; and use a fence, guide, bits with pilot bearings or a template wherever possible.

Router Bits

As previously mentioned, there are special bits with shaped cutting edges for special jobs. They may be of ground tool steel or fitted with tungsten carbide cutters. The most common diameter shanks are 6 mm and 12 mm, with the larger shanks recommended for heavy work and high speed routers. The router should never be forced when cutting, especially when 6 mm bits are used, as the heads have been known to shear off under load causing job damage and operator injury. The end of the cutter may be square, have a moulded shape, and have a solid pilot guide or a ball bearing pilot guide. The ball bearing pilot guide allows for easy cutting as the bearing reduces the friction between the timbers.



STUDENTS ACTIVITY:

a. Study the diagram of the bit given below and answer the questions that follow.


Source: www.google.com

i. Name the portable machine that uses the above bit.
_____

ii. Name the process in which this bit is used.
_____

iii. State one safety precaution that needs to be followed while using the machine stated in (i) above.
_____
_____

iv. Sketch the profile of the above bit after it has been used on timber.

Reference:

Year 11 Applied Technology Textbook, MEHA.

Subject: Applied Technology		**Year/Level:** 11
Week: 4	**Lesson** 5	**Date:**
Topic: Machines and Engine (Portable Power Planer)		

LESSON PREPARATION:

- Prepared lesson notes
- prepared follow up work

PREVIOUS LEARNING/PRIOR ASSOCIATED LEARNING:

Students have thorough knowledge on this portable power planer as they have learn the basics from year 9 where they cover on hand tools but relation with the iron jack plane. They play the same role but one is manually operated with man—power and the other one is operated with the availability of energy that enable the tool to be operated.

LEARNING OBJECTIVES:

At the end of the lesson, students should be able to:

Cognitive Domain:

1 Know and understand the different parts of the portable power planer.

Psychomotor Domain:

1 Operate the planer.
2 Apply all the safety precaution when operating the planer.

Affective Domain:

1) Appreciate and enjoy operating the portable planer on a given work piece.

TEACHING RESOURCES (MATERIAL AND VISUAL AIDS)

- Lesson notes

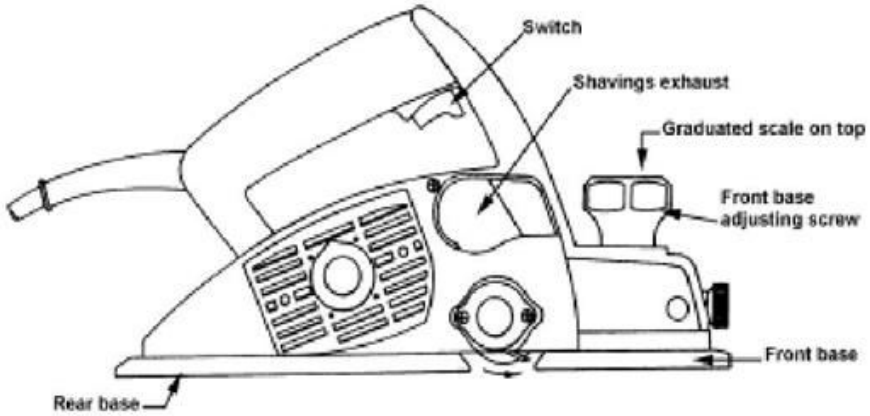
FOLLOW UP WORK:

- Students Activity

LESSON NOTES:

PORTABLE POWER PLANER

The power planer is a very high speed tool with a cutting head which revolves at between 12,000 - 16,000 revolutions per minute. The width of cut on most common types available is 82 mm, 110 mm or 155 mm. The depth of cut is variable but is limited when rebating due to the projection of housings and guards on the sides of the planer.



Parts of the Portable Power Planer and their Functions:

Rotating cutter head

Usually consists of two cutter blades, which are bolt fixed on opposite sides to a cylindrical cutter head. The head rotates in a downward direction when the blades pass the rear base or heel and in an upward direction when the blades pass the front base or toe. The blades are set so they contact the timber at the same point on each rotation, which allows the cutting work to be shared by both blades.

Fixed rear base (Heel)

This provides a stable foot for the planer similar to that of the common bench hand planes. The cutters are set so they are flush with this base so the planer can pass over the timber at a constant depth.

Adjustable front base (Toe)

This is where the depth of the cut is controlled. The front adjusting screw knob may be turned to allow raising or lowering of this base. There is a graduated scale at the base of the adjusting knob, which is usually set in millimetres so a controlled depth of cut can be maintained.

Body handle

This is where the operating trigger is located and allows the operator to hold the planer with both hands and depress the trigger at the same time. It also allows pressure to be maintained at the rear of the planer once the front base is no longer in contact with the job, to prevent rocking during use.

OPERATION OF THE PLANER

STEP 1 Secure the timber in a vice, cramp it down or fit a stop block at the front end as the cutting action of the planer tends to push the timber forward.

STEP 2 Adjust the depth of the front base to suit the job. It should be noted that the planer performs more efficiently when not under load, therefore a minimum of depth and a greater number of passes is the best approach. This is even more critical when planning very hard timbers.

STEP 3 Place the front base on the timber, making sure the blades are not touching the end, then depress the trigger allowing it to gain full speed. Push forward in a steady motion, while maintaining pressure on the front until the whole planer is supported on the timber. The position of the hands is usually the left hand on the front adjusting knob and the right on the rear handle and trigger, but this position may be switched.

STEP 4 When the planer is near the end of the timber; transfer the main pressure to the rear handle. This will allow the front base to pass off the end without tipping, which causes the cutters to bight into the timber and damage the job. When the cutters are no longer in contact with the timber, release the trigger, allow the cutter to stop rotating, then remove the planer and rest it on its side or rest the front base on a block.

SAFE OPERATION AND USE OF THE PORTABLE POWER PLANER

To use the portable power planer *CORRECTLY* and *SAFELY* you MUST:

- Always wear safety glasses and operate the machine with both hands;
- Rest the toe of the plane on a block of scrap timber when not in use to prevent accidental contact with the cutters and to provide protection to the cutting edges;
- Keep fingers clear of the underside of the base, cutters and exhaust chute;
- Do not force the planer or try to remove excessive amounts of waste as it may overload the motor and tear the grain in the timber;
- Make sure the cutters are sharp and correctly

adjusted for maximum performance;

- Always wait until the motor has stopped before removing the planer from the job.

STUDENTS ACTIVITY:

a. Study the diagram carefully and answer the questions that follow.

i. Name the portable machine shown in the diagram above.
_____

ii. Identify the part labeled **X.**
_____

iii. State the function of the part labeled **X.**
_____
_____

iv. Explain the process that this machine is used for.
_____
_____
_____

Reference:

Year 11 Applied Technology Textbook, MEHA.